THE SCIENCE NEWS-LETTER

A Weekly Summary of Current Science

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GERMANY MYSTERY CANNON SECRETS NOW MADE KNOWN

The secrets of the long-range German cannon that bombarded Paris from a distance of over sixty miles, closely guarded even after the Armistice, have now been permitted to leak out, following the recent death of the inventor, Dr. Fritz Rausenberger of the Krupp firm.

It has been generally guessed that the guns were the longest pieces of artillery that had ever been constructed, and the new information confirms these conjectures, for their length was 36 meters, or about 128 feet. Each gun was assembled out of three principal parts. Into an ordinary fifteen-inch naval gun an inner tube of 8.2-inch caliber, 98.4 feet long, was fitted, and over the part that projected beyond the naval gun an additional strengthening hoop was shrunk on. The total weight of the piecewas 154 tons.

The weight of the 8.2-inch shell was 220 pounds; its wall thickness was about two and three-fourths inches at the base and a little over one and one-half inches at the top. Its head was given an extraordinarily long taper, 15 to 20 inches, to aid in overcoming the resistance of the air.

To obtain its unprecedented range, the gun had to be fired at an extreme elevation. Theoretically, 45 degrees would have been the proper angle, but this would have been correct only in a vacuum, and to get the shell far up into the thin air, where resistance was low, the gun was set at 50 degrees. The angle of elevation remained fixed, and to correct for differences in wind, air pressure, etc., the powder charge was varied, being calculated anew for each separate shot. The charge for the longest range at which any of these guns was ever fired, 80 miles, was 660 pounds. At the range of 74 miles, the shell reached heights of over 25 miles, making more than two-thirds of its flight at elevations of over six miles, or half a mile higher than Mt. Everest. The time of flight was three minutes.

Due to the great length of the gun and the very heavy powder charge, the comparatively light shell left the gun's muzzle at the velocity of over a mile per second, with the enormous muzzle energy of 43,000 foot tons -- enough to lift the whole mass of the world's largest battleship a foot into the air.

Because the shells tended to drop on their target, the city of Paris, sidewise instead of end on as a projectile normally does, it was necessary to provide them with two fuses to insure their explosion on impact. The fuse system worked successfully, for none of the shells that struck Paris failed to explode. Another difficulty arose due to the long, high flight of the shell; the rotation of the earth

TABLOID BOOK REVIEW

EARLY STEPS IN SCIENCE. Hanor A. Webb and John J. Didcock. New York. D. Appleton and Co. 691 pages.

To make the boy and girl of high school age feel and test for themselves the personal importance of science is the aim of this book, written by two professors of the George Peabody College for Teachers. This idea of bringing science as a reality into the life of the reader has been carried out on every page of the text.

The book is not large despite its 691 pages, and it covers an astonishing range of scientific information, for example, tests for identifying textiles used in clothes, explanations of how an automobile engine runs and how germ diseases are carried. An unusual feature is the chapter on "Man as a Living Creature" in which the authors demonstrate that psychology can be presented attractively and profitably to high school students. In a very practical section of this chapter, several ways of memorizing a poem are analyzed and compared, so that the student may test on himself the efficiency of different methods of learning.

For a general science course, particularly for later years of high school, it should be very successful.

MODERN MAGNETICS; by Felix Auerbach, translated by H. C. Booth, E. P. Dutton & Co., N.Y., 1926. 306 pp., $6.00.

According to the publishers, "Modern Magnetics" is "a comprehensive yet compact exposition of the subject written for the general reader and presented with a minimum of mathematical methods", and this description is well justified. Such subjects as the magnetism ofthe earth, the effect of a magnetic field on light, the theory of the magnetization of substances are adequately covered. Its utility is enhanced by a well selected bibliography of the most important references in this extensive field.

CARBOHYDRATE METABOLISM AND INSULIN; by John J. R. Macleod. Longmans, Green and Co. Ltd., London, 1926, 357 pp., $6.00.

A summing up of recent advances in medical knowledge of the mechanism of sugar metabolism has been gathered between two covers by the man under whose supervision Banting and Best undertook the experiments that led to the isolation of insulin. A history of this research and the nature of the diabetic conditions which obtain when insulin is withdrawn from the body are given in considerable detail. On the whole this is a comprehensive survey that students and all workers in this field will find extremely useful as a reference book.

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tended to deflect its path, sometimes nearly as much as half a mile.

The terrifically high pressure, temperature and friction of the discharge of the piece tended to make the barrel bulge slightly, and because of its great length the gun tended to "whip", raising the danger of a premature explosion of the shell in the tube. This did happen once, ruining one of the four guns. The other three, according to the terms of the Armistice, were dismantled and destroyed.

The designer of the battery, Dr. Fritz Rausenberger of Baden-Baden, was a well-known authority on ballistics, and had for several years been associated with the Krupp firm. In addition to the long-range gun, he designed the great 42-centimeter "Big Bertha" that destroyed the Belgian forts early in the war. This was a relatively short-barrelled howitzer of not great range, but of terrific smashing power, due to the enormous weight of its shells and the heavy charge of high explosive it carried.

PLANT GEOMETRY

Chat on Science
By Dr. Edwin E. Slosson, Director, Science Service

All plants and animals are constructed out of little building blocks of a very similar sort. Each block is a cell, which , when fresh and living, consists of a tiny drop of jellied sap or juice enclosed in a thin-walled sac. Cut a thin slice of any vegetable or animal matter, put it under a microscope and you can see the individual cells. When free and separate they are round. When compressed together in a mass they form various flat-sided figures, mostly of four, five or six sides.

This suggests two questions. Why are the free cells round? What shape are the massed cells?

The answer to both questions is the same. The cells in both cases take the shape that will comprise the most substance in the smallest space. It is an instance of Nature's economy; an effort to make the cell-wall stuff go as far as possible.

It is easy to see why cells are spherical whenever they can be. They take that shape for the same reason as a bubble or balloon, a pebble or a marble. You do not have to mold a soap bubble or a rubber balloon. You just blow it up and it takes the shape that will hold the gas or hot air with the least stretching of the enclosing film. Put a lot of irregular fragments of marble into a barrel, attach the barrel to a water wheel, so it will be kept rolling. By and by you will find that all the pieces of rock, however angular and knobby they may have been on the start, have been ground into the same form, a sphere. By rubbing against one another all their angles and prominences have been knocked off, and when you knock off all the corners and projections from anything you have a sphere. The pebbles and sand grains on a seashore have been ground down by friction into the same shape, which is the form that includes the largest amount of material with the smallest surface.

But when you mass the cells you get a different and more difficult problem, one in fact that has been a puzzle for more than a hundred and fifty years. For when you pack together a lot of spheres, say shot or oranges in a box, you find that they do not fit together but leave waste space in between them. Each sphere, except those on the outside layer, is in touch with twelve others. You can see

this by putting a pea on the table top. You will find that it takes six others to form a ring around it. On top of the group you can set three others, and of course three more could find place below it. If then you should compress a bunch of spheres the twelve points of contact would become flat faces, and when all the empty space was squeezed out the interior spheres would all become twelve sided figures. Buffon, the great French naturalist of the eighteenth century, tried this experiment by packing dry peas in a jar and then soaking them with water till they swelled tight together. Experiments with masses of bubbles confirmed this twelve-sided shape as an economical form. Of the twelve faces six are triangles and six are hexagons. The honey-bee uses this form for its comb.

But Lord Kelvin, the great English physicist of the nineteenth century, found that space could be filled compactly and with less sacrifice of the spherical form by a more stable figure having fourteen sides instead of twelve. And now Dr. F. T. Lewis of Harvard Medical School, after many years of study, finds that vegetable and animal cells generally tend to take this fourteen-sided figure. He has mapped and measured with the microscope consecutive sections of various tissues, such as elder pith and human fat, and then constructed large wax models of the cells that would account for the observed contacts. They are very irregular and differ in the number of their flat faces because they get distorted by the pressure of their selfish neighbors, but can be best regarded as all derived from this fundamental fourteen-sided form.

I say "fourteen-sided form" because I hate to use the proper geometrical term for it, the tetrakaidecahedron. But the figure itself is not so ungainly as its name as you will find if you cut one out of soap or mold it out of putty. Eight of its faces are hexagons and six are squares. There are thirty-six edges where two faces intersect and twenty-four corners where three faces intersect. Such figures fit together as prettily as a Chinese puzzle, each in touch with fourteen neighbors. It is worth while getting acquainted with it since it is the pattern approached by the twelve thousand million cells that constitute your skin, as well as incalculable myriads inside of it.

WORLD PLANT SCIENTISTS ASSEMBLE AT ITHACA, N.Y.

Scientists from all over the world met on the campusof Cornell University during the week of August 16, where they discussed international problems in botany, agriculture, horticulture, forestry, the evolution of new and improved forms of plant life by plant breeding, and kindred subjects. While European statesmen fritter away their time in diplomatic meetings that come to nothing because of nationalistic selfishnesses, their scientific compatriots came to America to meet in a spirit of friendly cooperation with men who once were enemies, to work with them in arranging for common action in improving the world's crops, in banishing insect and fungus pests, and most of all in the solution of the fundamental problems in botany that underly all possible practical advances.

Prof. Lester W. Sharp, chairman of the program committee, estimated there would be nearly 2,000 delegates present. Most of these naturally came from the United States and Canada, but a considerable proportion represented European and Asiatic nations. The register of foreign countries included Great Britain and Ireland, France, Germany, Russia, Italy, Norway, Sweden, Denmark, Czechoslovakia, Poland, Switzerland, Holland, Belgium, Roumania, Jugoslavia, Japan, India, Java, and Bermuda.

The program called for 115 papers on all phases of plant life, of which about one-half were delivered by the visitors from overseas.

Officially the gathering of scientists was known as the International Congress of Plant Sciences. Similar international congresses have been held in the past in Europe, but this was the first one ever to be held in the United States, and it was also the first one to be held since the War. Another unique feature is that here for the first time since the War scientists of former enemy countries were invited on terms of exact equality with those of the Allied nations.

The chairman of the Congress was Prof. Liberty H. Bailey, veteran educator and publisher in botanical subjects, who also holds office as president of the American Association for the Advancement of Science and president of the Botanical Society of America. The vice chairman was Prof. John M. Coulter, emeritus head of the botany department of the University of Chicago and now at the Boyce Thompson Institute for Plant Research at Yonkers , N.Y., recognized as dean of American botanists. Honorary vice-chairman were chosen from among the foreign visitors to act as chairmen of the various sections of the Congress.

CELL CONTENTS OF PLANTS HAVE HIGH SUCTION POWER

The tiny cells of which plants are built are the most efficient suction pumps in the world, according to the figures of Prof. A. Ursprung of the University of Freiburg, Switzerland. In an address before the International Congress of Plant Sciences, he told of suction forces exercised by their living contents that mounted above thirty atmospheres of pressure, or on the order of 500 pounds per square inch.

He said that the lowest suctions he found exerted by plants were those in the outer cells of the roots, which were less than eight pounds per square inch. From here toward the uppermost leaves the power mounted, until the maximum figure was reached at the tops of tall trees, or in smaller plants in dry, gravelly soil on the mountains.

"The influence of the climatic and soil factors on the suction force was also studied," said Prof. Ursprung. "It was found that the moisture of the soil plays the chief role: A heavy rain caused the suction force of the leaf of a certain alpine plant to fall from about 500 pounds per square inch to about 211."

Some cells were found to exert more suction on one side than on the other. Thus, a certain cell layer in the interior of a root exerted a suction of only seven and one-half pounds per square inch on its outer side, and over nine times that much on the side toward the center of the root.

The members of the Congress displayed great interest in the discoveries of Prof. Ursprung, declaring that they constituted a very considerable contribution to the answers of the problems presented by the intake and transportation of water by plants, which lie at the bottom of crop production, forestry, and many other applications of botany as well as of the more purely theoretical aspects of the science.

NORTHERN SPRING FLOWERS COLONIZED FLORIDA HILLS

Human tourists have not been the only northern winter colonists who have found Florida climate and scenery to their liking. The wildflowers of New England and the upper Mississippi valley preceded the people of these regions into the hills of the South, probably by many thousands of years, and they are still there. What is more, they preserve to a considerable degree the life-habits of their original homeland, according to Prof. Herman Kurz of the Florida State College for Women at Tallahassee, who is a member of the summer faculty of the University of Chicago.

In his report, published in a recent issue of the Botanical Gazette, Prof. Kurz calls attention to the presence in various parts of the north-western extension, or "panhandle", of thestate of Florida, of disjunct patches, or "islands" of northern plants, inhabiting rich, moist hill forests in the midst of sandy flats and an "ocean" composed of swamps that support a vegetation more typical of the South. Two such "islands" are already fairly well known to botanists; Prof. Kurz now calls attention to a colony of "Yankee" plants occupying a third, on the Tallahassee red hills. In such woods, under North-suggesting trees like beech, maple, elm, hickory, basswood and hackberry, typically northern spring flowers can be found, including Jack-in-the-pulpit, green dragon, buttercup, trillium, bloodroot, phlox, Indian pink, Solomon's seal and bellwort, with flowering shrubs like witch hazel and mountain laurel. In such a woodland one could easily imagine himself five hundred or a thousand miles farther north.

It had been commonly assumed, and sometimes stated in botanical writings, that the habits of the northern flowers, which in the North bring a rush of bloom in April and May, had been lost, and that these colonists blossomed at all sorts of odd times. Prof. Kurz states, however, that this is not the case. He has made a careful study of the time of blooming of over three hundred of the species in the red hill country around Tallahassee, and he finds that it rises to a climax there almost as marked as the high tide of bloom in the woods of the North. Only the climax comes earlier, as might perhaps be expected, arriving in March and falling off sharply by the end of May. During the rainy winter season, a low point in blooming can be noted, comparable, with the enforced dormancy during the snow-bound northern winter. The thing that has led many botanists to assume an indefinite period of blossoming, Prof. Kurz states, is the habit of certain weedy roadside flowers, probably more recent arrivals from the North, of flowering even in winter. He found such plants as toadflax, Venus' mirror, plantain, sneezewood, evening primrose , and oxalis in bloom in February and some of them even in January. But these, he believes, constitute an exceptional class, and their blossoming habit has only served to mask the real fidelity of the true woodland spring flowers to the periodical blossoming of their original home in the North.

The U. S. Bureau of Standards is using two "fade-meters" to test the effects of light on different dyed materials.

It takes much longer to cook foods high in the mountains, because water boils at a lower temperature at high altitudes.

SIZE OF SEED HAS NO EFFECT ON SIZE OF VEGETABLE

Big seeds do not necessarily bring forth big cabbages, nor little seeds little cabbages, according to Dr. Felix Kotowski of the College of Agriculture at Warsaw, who told of his experiments with garden truck seeds before the International Congress of Plant Sciences.

Dr. Kotowski wanted to find out whether or not there was anything in the popular notion that big seeds were better than small ones, and he made a large number of plantings, mainly of cabbages. He found, he said, that the size of the seed influenced the size of the plants while they were still quite young, but that after early maturity was reached this early handicap was apparently entirely lost, and the crop from the small-seed acres was quite as heavy as that from the large-seed field. The better the soil, he added, the sooner was the early handicap overcome.

BIBLICAL PUZZLE SOLVED BY DISCOVERY AT LYSTRA

An event in the life of the Apostle Paul, which has long puzzled scientists and Biblical students alike, has at last been explained, according to an announcement made by two experts on Greek inscriptions, Prof. W. M. Calder, of Manchester University, England, and W. H. Buckler, from Baltimore.

The puzzle question is, why were Paul and Barnabas saluted respectively as Hermes and Zeus when they appeared in the town of Lystra in Asia Minor. For answer the two Greek scholars point to inscriptions and carvings which they have found near the town, which indicate that these were the two gods regularly worshipped by the natives of the Valley of Lystra.

The general reason why the mystified inhabitants thought the two strangers were gods is traced to the statement that Paul healed a man who had been crippled from birth. But why these two particular gods were chosen has never been understood.

Prof. Calder states that "archeologists have long searched for the answer among the monuments of the Valley of Lystra, but these monuments revealed nothing about the ancient religion of the valley."

Recently, however, he and Mr. Buckler were journeying in this region under the auspices of the American Society for Archaeological Research in Asia Minor, when an accidental detour brought them to Kavak, seven miles from Lystra. While here they found a limestone altar in the courtyard of a house. The stone bore a Greek inscription, defaced and worn. The inscription ended, Prof. Calder says, in the words "to the god who harkens to prayer and to the god ...and to Hermes a vow." The name of the second god is lost but the Greek letters for Zeus would exactly fit in the gap, he states.

At the same place the two scientists were also shown a small bronze figure of Hermes with an eagle, the bird of Zeus, beside him.

Earlier evidence of the prominence of these two deities in the region had been found in 1909 by Prof. Calder at another place, a day's journey, from Lystra. This discovery was an inscription telling of the dedication of a figure of Hermes together with the dedication of a sun dial to Zeus. The dedicators, Prof. Calder

points out, were of the same racial stock as the people of Lystra.

Ovid's story, that Zeus and Hermes appeared in a Phrygian valley to found a temple for their joint worship, has been used to discredit the story in the Book of Acts, on the theory that the two narratives were confused versions of the same tradition. Prof. Calder believes that his finds prove that the Biblo story has a solid and logical historic background, as the event would have been a natural happening in this region.

CIVILIZED INDIANS LIVED IN PREHISTORIC LOUISIANA

Evidence of a race of Indians who rank among the most highly civilized of all prehistoric tribes in this country has been discovered in the marshy bayou country of Southern Louisiana, according to announcement made by Henry B. Collins Jr., of the National Museum, who has just returned from the first attempt to explore the region.

Mr. Collins, who is assistant curator of ethnology, says that these Indians were "Americans" before Columbus, and that their only equals in prehistoric Indian civilization north of Mexico were possibly the Pueblos.

"The Gulf Coast of Louisiana has been totally unknown country from an archeological standpoint," said Mr. Collins. "The only Indians ever known to live along the western part of the Louisiana coast were the Attacapa or 'man eaters', a tribe of low culture which wandered about the marsh region in more modern times and won the reputation of being cannibals.

"The prehistoric residents of this section of Louisiana show no relationship to these later Indians. They were mound builders, like other ancient tribes of high culture in the Mississippi Valley and the Gulf States, and they had the same general kind of culture. It is possible that the Chitimacha of Louisiana are the descendants of these ancient mound building tribes.

"The Louisiana mound builders made pottery of exceptionally high type, as is shown by the many decorated fragments found in mounds and shell heaps of the bayou region. Shell beads and other ornaments which we found among the remains show that they were skilled workmen and were possessed of considerable artistic ability."

A copper coated double disc three and one-half inches in diameter, which was probably worn as an ear ornament, and several other copper objects are considered by Mr. Collins as evidence that these far southern people traded with distant tribes. The copper, which is similar to that used by other mound building tribes, must have come from near Lake Superior, and the stone beneath the copper coating is from some more northern part of the country than Louisiana.

A collection of about 50 skulls brought back by Mr. Collins is considered of special interest since most of them are not deformed.

"It was a regular practice among southern Indians for a mother to place a bag of sand or a board on an infant's forehead," said Mr. Collins. "Heads of children of other Indian tribes were flattened at the back by placing them on hard cradle boards. This practice of head flattening so distorts the proportions of the skull that it has often been difficult to obtain reliable information as to the head

measurements of the mound building tribes. Some of these Louisiana skulls are flattened in this way, but most of them have been left in their natural shape and these will be carefully studied."

The most extensive work done by this first expedition to the Louisiana marshes was on Pecan Island, an old reef of the Gulf fifteen miles long. On this island 21 mounds were discovered and a large number of bones of the Indians and of deer, bears, and other animals which they hunted.

SLEEPING SICKNESS VICTIMS RE-EDUCATED LIKE CRIPPLES

Children whose characters are strangely warped as a result of the European sleeping sickness have crippled brains and may be classed with crippled children, even though they have no visible deformity of body. This new idea in dealing with the serious after effects of sleeping sickness is proposed by Miss Helvi Haahti, a Finnish psychiatrist who has been conducting tests at the Institute of Juvenile Research of Illinois.

The number of children who are left by this disease with overpowering desires to steal, commit sex offenses, lie, and run away from home is sufficient to make them a serious social problem, but most cities have made no special provision for their education or re-training.

Miss Haahti reports that as an experiment seven children who had had sleeping sickness were admitted to a special school for physically crippled children, in Chicago, and were treated like the other cripples, with promising results.

Sleeping sickness victims, who were often quiet, well behaved children before the attack, are usually considered bad because of their strange behavior, and are dealt with accordingly by parents and teachers, she states. In the special school for cripples these children were in close contact with teachers who understood the defects and with children who know that they were "sick" just like the rest of the class except that the disability was in a different part of the body.

The chief problem is to re-establish the child's good physical and mental habits, which were destroyed during the acute stage of the disease, Miss Haahti states. Typical physical bad habits of these children are a peculiar gait, and jerky, awkward movements of the arms, which indicate the same lack of self control that leads them to fall into violent rages or to steal money from a neighbor.

She finds that "the question which has not yet been sufficiently answered is whether these good habits can be reestablished by careful habit training over a long period of time, or whether the nerve paths were permanently destroyed by the disease so that retraining would not be possible."

Unusual damage from insect pests caused some Ohio farmers to have to replant corn three times this year.

MIDNIGHT OIL "BAD MEDICINE" SAYS NOTED ENGLISH DOCTOR

The diligent burner of the midnight oil sounds all right in highly moral fiction, but the more sensible thing to do is to read a silly novel or play solitaire for a couple of hours before you go to bed, according to the opinion of Sir James Crichton-Brown, eminent English physician. Sir James characterized "home work" for school children, if it keeps them up late, as downright iniquitous.

As long as the brain is active, it is throwing off waste products, and these are best eliminated during the first part of the night's sleep; but removal of waste products, and also repair of tissue, take place to some extent when the brain is in a sub-somnolent state, such as during some forms of insomnia.

Individuals sleep requirements vary, Sir James said, but the average amounts of sleep needed by humans are as follows: at birth: 24 hours; at three months: 20 hours; six months: 18 hours; from 1 to 5 years: 14 hours; from 5 to 10 years: 12 hours; from 10 to 13 years: 11 hours; from 13 to 30 years: 9 hours; above 30 years: 8 hours.

CANADA MAKES OUTDOOR MUSEUM FOR TRAIN TOURISTS

Tourists in western Canada can now "do" one museum on the fly, merely by looking out of a train window or automobile. This unique, panorama-like museum, which is in process of completion, is a large collection of fine old Indian totem poles.

The collection is being established by the Canadian Department of Indian Affairs, and experts from the Canadian Government Museum are now at work preserving the poles, so that the wood will not decay further from exposure to weather. As good specimens of these grotesque Indian carvings are becoming rare, the collection has considerable value as well as being picturesque.

Harlan I. Smith, representative of the Canadian Government Museum , is now at Kitwanga, B.C., where he is directing the preservation of seventeen poles, and next season poles at nearby stations are to be put into condition as permanent exhibits. In all, about thirty-three poles can be viewed from passing trains, and 100 can be seen by automobile in a fifteen mile ride.

Palestine has recently made remarkable progress in reducing disease, mainly by sanitation measures.

Few of the Eskimos of Labrador live to be over 60 years old, because of their feeble resistance to disease.